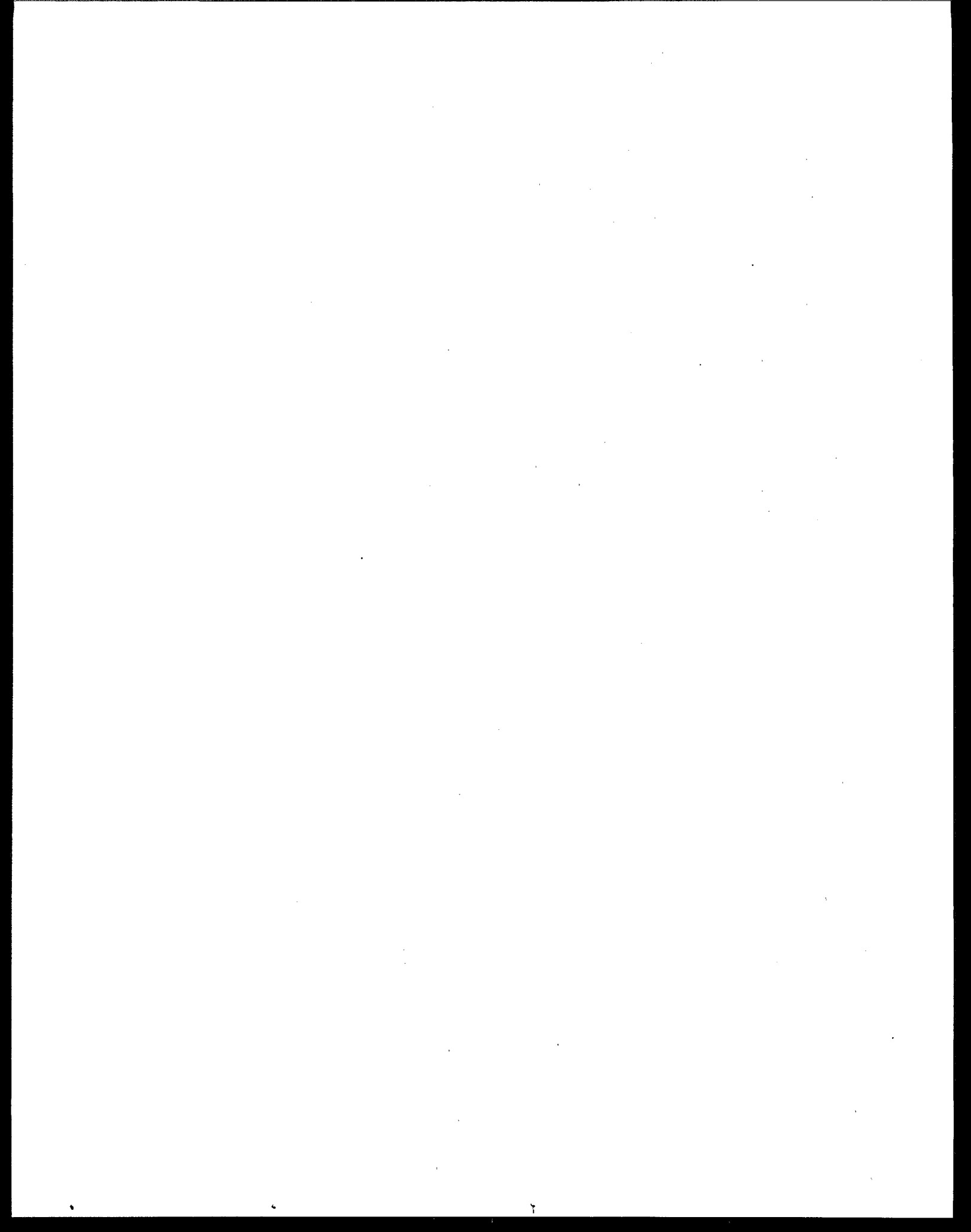




# **Title III Section 313 Release Reporting Guidance**

*Estimating Chemical Releases From  
Electrodeposition of Organic Coatings*



# Estimating Chemical Releases From Electrodeposition of Organic Coatings

Appliers of organic coatings via electrodeposition (EDP) may be required to report annually any releases to the environment of certain chemicals regulated under Section 313, Title III, of the Superfund Amendments and Reauthorization Act (SARA) of 1986. If your facility is classified under SIC codes 20 through 39 and has 10 or more full-time employees, for calendar year 1987 you must report all environmental releases of any Section 313-listed chemical or chemical category manufactured or processed by your facility in an amount exceeding 75,000 pounds per year or otherwise used in an amount exceeding 10,000 pounds per year. For calendar years 1988 and 1989 (and beyond), the threshold reporting quantity for manufactured or processed chemicals drops to 50,000 and 25,000 pounds per year, respectively.

This document has been developed to assist appliers of organic coatings in the completion of Part III (Chemical Specific Information) of the Toxic Chemical Release Inventory Reporting Form. Included herein is general information on toxic chemicals used and process wastes generated, along with several examples to demonstrate the types of data needed and various methodologies available for estimating releases. If your facility performs other operations in addition to EDP, you must also include any releases of toxic chemicals from these operations.

## Step One

*Determine if your facility processes or uses any of the chemicals subject to reporting under Section 313.*

A suggested approach for determination of the chemicals your facility uses that could be subject to reporting requirements is to make a detailed review of the chemicals and materials you have purchased. If you do not know the specific ingredients of a chemical formulation, consult your suppliers for this information. If they will not provide this information, you must follow the steps outlined to handle this eventuality in the instructions provided with the Toxic Chemical Release Inventory Reporting Form.

The list presented here includes chemicals typically used in EDP of organic coatings that are subject to reporting under Section 313. This list does not necessarily include all of the chemicals your facility uses that are subject to reporting, and it may include many chemicals that you do not use. You should also determine whether any of the listed chemicals are created during processing at your facility.

**Solvents:** Approximately 50 solvents are on the Section 313 list; these include, among others, 1,1,2-trichloroethane, n-butyl alcohol, ethylene glycol, 2-ethoxyethanol, xylene, and toluene

**Pigments:** Primarily metal-containing compounds, such as titanium dioxide, zinc oxide, white lead, barium sulfate, chromium oxide, and nickel titanate

**Additives:** Curing agents, surfactants, defoamers, thickeners, film-control agents, and plasticizers (for example, dibutyl phthalate, dimethyl phthalate, ammonia, and diethanolamine)

**Resin precursors (residues/impurities):** Ethyl acrylate, formaldehyde, vinyl chloride, methyl acrylate, acrylic acid, acrylonitrile, ethylene glycol, melamine, vinylidene chloride, styrene, 1,3-butadiene, and phenol

## Step Two

*Determine if your facility surpassed the threshold quantities established for reporting of listed chemicals last year.*

You must submit a separate Toxic Chemical Release Inventory Reporting Form for each listed chemical that is "manufactured," "processed," or "otherwise used" at your facility in excess of the threshold quantities presented earlier. Manufacture includes materials produced as byproducts or impurities. Toxic compounds that are incorporated into your products (for example, a pigment coated onto a metal part) would be considered "processed" because they become part of the marketed finished product. Degreasing solvents, cleaning agents, and other chemicals that do not become part of the finished product would be considered "otherwise used."

The amount of a chemical processed or otherwise used at your facility represents the amount purchased during the year, adjusted for beginning and ending inventories. To ascertain the amount of chemical in a mixed formulation, multiply the amount of the mixture (in pounds) by the concentration of the chemical (weight percent) to obtain the amount of chemical processed.

**Example: Calculating annual use of toluene through purchases and inventory changes.**

Opening stock	5,000 lb
Plus purchases during year	12,000 lb
	<u>17,000 lb</u>
Less closing stock	6,000 lb
Total use	<u>11,000 lb</u>

A listed chemical may be a component of several formulations you purchase, so you may need to ask your supplier for information on the concentration (percentage) of the chemical in each. For chemical categories, your reporting obligations are determined by the total amounts of all chemicals in the category.

**Example: Estimating usage of n-butyl alcohol (NBA) in coating formulations.**

In 1987, a plant used from inventory 10,000 gallons of a coating formulation containing 15 percent NBA by volume. It also purchased 350 gallons of a formulation containing 98.4 percent NBA by volume, which was used for thinning. Total annual usage of NBA was as follows:

$$\begin{aligned}\text{Annual usage of NBA} &= \\ & (10,000 \text{ gal} \times 0.15) + \\ & (350 \text{ gal} \times 0.984) \\ & = 1,844 \text{ gal}\end{aligned}$$

The density of NBA is 0.810 kg/liter. The annual usage in gallons can therefore be converted to pounds as follows:

Annual usage of NBA =

1,844 gal x

3.785 liters/1 gal x

0.810 kg/1 liter x

2.205 lb/1 kg

= 12,465 lb

The use threshold applies because the NBA is not incorporated into the final article. Because the plant uses more than 10,000 pounds per year of NBA, it must complete a Toxic Chemical Release Inventory Reporting Form.

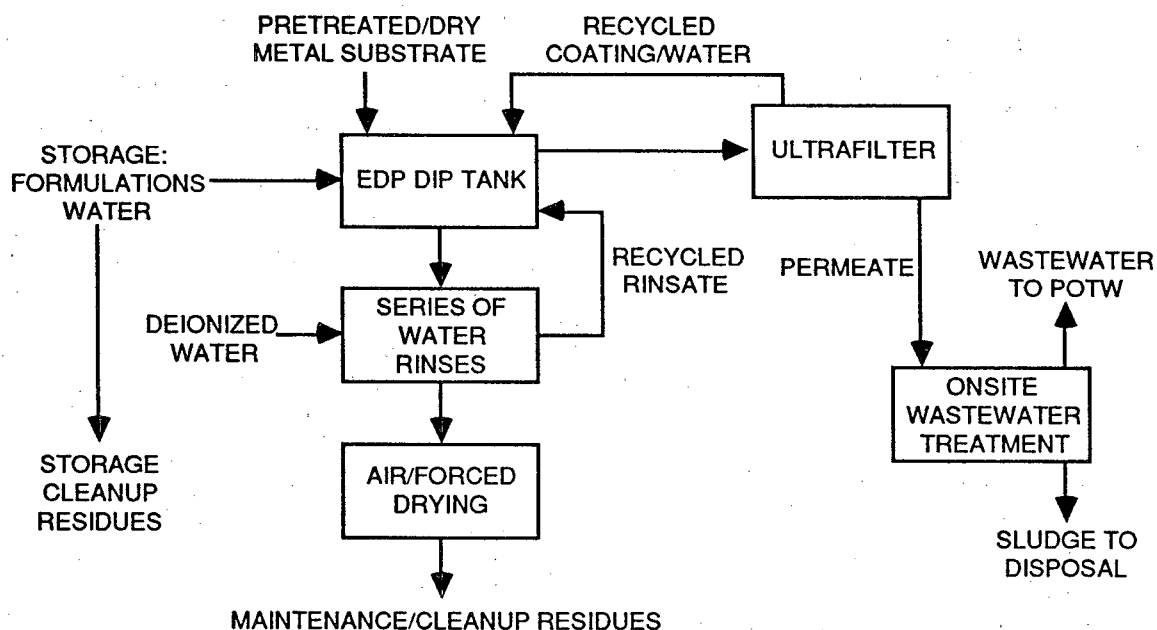
You must complete a report for each chemical for which a threshold is exceeded. The thresholds apply separately; therefore, if you both process and use a chemical and either threshold is exceeded, you must report for both activities. If neither threshold is exceeded, no report is needed.

## Step Three

*Identify points of release for the chemical(s) subject to reporting.*

An effective means of evaluating points of release for listed toxic chemicals is to draw a process flow diagram identifying the operations performed at your facility. The figure below is an example flow diagram for EDP of organic coatings. Because each facility is unique, you are strongly urged to develop a flow diagram for your particular operations that details the input of materials and chemicals and the waste sources resulting from the operation of each unit.

The major releases in EDP coating operations consist of the coating components that are not transferred to the coated substrate. These are likely to be discharged from the EDP tank. If you have onsite wastewater treatment, you might also have wastewater sludge containing the chemical. Other



**Example Flow Diagram of Electrodeposition of Organic Coatings**

releases may come from discarded shipping containers, cleanup operations, or (in the case of some substances) volatilization to the air. Your reporting must account for all releases.

## Step Four

### *Estimate releases of toxic chemicals.*

After all of the toxic chemicals and waste sources have been identified, you can estimate the releases of the individual chemicals. Section 313 requires that releases to air, water, and land and transfers to offsite facilities be reported for each toxic chemical meeting the threshold reporting values. The usual approach entails first estimating releases from waste sources at your facility (that is, wastewater, air release points, and solid waste) and then, based on the disposal method used, determining whether releases from a particular waste source are to air, water, land, or an offsite disposal facility.

In general, there are four types of release estimation techniques:

- **Direct measurement**
- **Mass balance**
- **Engineering calculations**
- **Emission factors**

Descriptions of these techniques are provided in the EPA general Section 313 guidance document, *Estimating Releases and Waste-Treatment Efficiencies for the Toxic Chemical Release Inventory Form*.

Provisions of the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, and other regulations require

monitoring of certain waste streams. If available, data gathered for these purposes can be used to estimate releases. When only a small amount of direct measurement data is available, you must decide if another estimation technique would give a more accurate estimate. Mass balance techniques and engineering assumptions and calculations can be used in a variety of situations to estimate toxic releases. These methods of estimation rely heavily on process operating parameters; thus, the techniques developed are very site-specific. Emission factors are available for some industries in publications referenced in the general Section 313 guidance document. Also, emission factors for your particular facility can be developed in-house by performing detailed measurements of wastes at different production levels.

For EDP coating operations, the transfer efficiency will be a major determinant of the amount of material released. This efficiency will vary significantly among systems. If specific data for your system are not available, a transfer efficiency of 97 percent may be assumed for estimation purposes (that is, 97 percent of the coating solids are transferred to the substrate).

### **Toxic Releases Via Wastewater**

If you have monitoring data specific to the chemicals you process or use, you should use these data for reporting purposes. For example, if wastewater has been monitored prior to discharge, the amount of chemical released in wastewater can be calculated as follows:

$$\begin{aligned} \text{Amount of chemical released} = & \\ & \text{concentration in wastewater} \times \\ & \text{daily volume of wastewater} \times \\ & \text{days/year for which data apply} \end{aligned}$$

Review all available monitoring data to determine a representative concentration to use in this calculation. In the absence of such data, the following approaches can be used to estimate releases.

Ultrafiltration is commonly used as part of electrodeposition coating systems. The permeate or ultrafiltrate that results from this operation probably will be transferred to onsite wastewater treatment. Although most of the organic chemicals in your coating are expected to be recycled into the EDP tank, a certain fraction of them could be present in the permeate or ultrafiltrate.

Chemicals that are suspended in the formulation (for example, pigments, resin precursors, and some additives, which can also be thought of as solids) are not soluble in water. If you have monitoring data for the chemical concentration in the permeate stream, use it to estimate releases. If no data are available, you may estimate the amount of chemical lost by assuming that 0.5 percent of the total solids in the coating applied are released with the permeate and calculate the amount in the permeate as follows:

$$\begin{aligned} \text{Amount of chemical lost in permeate} = \\ \text{amount of coating applied} \times \\ (\text{weight percent of chemical in coating} \times \\ 0.005) \end{aligned}$$

Water-soluble species include the various solvents in the coating formulation, along with some other organics that may be part of the resin system or of the additives. If monitoring data are available for the specific chemical concentration in the permeate stream, you should use these data for reporting purposes. If such data are not available, the amount of chemical lost in this stream can be estimated as follows, based on the water solubility of the chemical and the permeate stream flow rate:

$$\begin{aligned} \text{Amount of chemical lost in permeate} = \\ \text{amount of permeate released/year} \times \\ \text{water solubility of chemical} \end{aligned}$$

If the permeate stream is sent to wastewater treatment on site, you should adjust "losses" to yield "release." You may base your estimate of the amount released on treatment efficiencies. Use actual operating data on

removal efficiency or published data for a treatment similar to that used at your site, as follows:

$$\begin{aligned} \text{Amount of chemical released after} \\ \text{wastewater treatment} = \\ \text{amount lost in permeate} \times \\ (1 - \text{removal efficiency}) \end{aligned}$$

### **Toxic Releases Via Solid Waste**

The major source of release for "solids" is expected to be the EDP tank residues. These solids build up as a result of EDP process inefficiencies and are periodically collected when the tank contents are "dumped" for cleanup purposes. To obtain the quantity of chemical released, simply multiply the weight of sludge removed by the known concentration of the chemical. If such data are not available, you can base your estimate of the amount of chemical in the sludge on the EDP transfer efficiency and the amount lost in the permeate:

$$\begin{aligned} \text{Amount of chemical lost in sludge} = \\ \text{amount of chemical applied} \times \\ (1 - \text{transfer efficiency}) - \\ \text{amount lost in permeate} \end{aligned}$$

#### **Example: Estimating releases in EDP tank sludge.**

A plant used 60,000 pounds of a pigment in 1987. Of this amount, 97 percent is estimated to have been transferred to the coated substrate and 0.5 percent is estimated to have been lost to water.

$$\begin{aligned} \text{Amount of pigment in sludge} = \\ 60,000 \text{ lb pigment} \times \\ (1 - 0.97) - \\ (60,000 \text{ lb} \times 0.005) \\ = 1,500 \text{ lb} \end{aligned}$$

This release should be reported under the appropriate category of disposal. If hazardous waste regulations apply to your sludge, report this release according to any special handling procedures that may apply.

A fraction of the water-soluble species is expected to be removed with the coating sludge. Use any specific data on the sludge's concentration and its disposal rate, as discussed for the release of solids. If no monitoring data for the sludge are available, you may estimate the amount of a water-soluble substance in the sludge based on its solubility in water and the percentage of water in the removed sludge:

$$\begin{aligned} \text{Amount of chemical in sludge} = & \\ & \text{amount of sludge} \times \\ & \text{weight percent water in sludge} \times \\ & \text{water solubility of chemical} \end{aligned}$$

### **Toxic Releases to Air**

Volatile species (mainly solvents) processed or used at your site could be released to air because of their relatively high vapor pressures. If they have not been measured, air releases can be estimated as the difference between total chemical applied and chemical lost in water and solid wastes. This mass balance will be as follows:

$$\begin{aligned} \text{Amount of chemical released to air} = & \\ & \text{amount applied} - \\ & \text{amount lost in permeate} - \\ & \text{amount lost in sludge} - \\ & \text{amount lost in process-related releases} \end{aligned}$$

#### **Example: Using a mass balance to estimate air releases.**

In 1987 a plant used 150,000 pounds of a 55 percent water-soluble solvent. This solvent was used for 50 days, during which 210,000 pounds of permeate was drained from the system and 55,000 pounds of water was removed with the system's sludge during cleanup operations.

*Amount of solvent released to air =*

$$\begin{aligned} & 150,000 \text{ lb used} - \\ & (210,000 \text{ lb} \times 0.55) - \\ & (55,000 \text{ lb} \times 0.55) \\ & = 4,250 \text{ lb} \end{aligned}$$

*Using this approach, the plant in this example could report air emissions of 4,300 pounds of solvent.*

If volatile emissions are controlled (for example, by carbon adsorption or incineration), apply the measured or estimated control efficiency to obtain actual releases to air. Account for any of the chemical transferred to other wastes (for example, spent carbon), and report it in the appropriate portion of the form.

### **Other Toxic Releases**

Electrodeposition of organic coatings produces other wastes from which toxic chemicals may be released. These include:

- **Residues from pollution control devices**
- **Wash water from equipment cleaning**
- **Product rejects**
- **Used equipment**
- **Empty chemical containers**

Releases from these sources may already have been accounted for, depending on the release estimation methods used. These items (and any other of a similar nature) should be included in the development of your process flow diagram.



The contribution of sources of wastes such as cleaning out vessels or discarding containers should be small compared with process losses. If you do not have data on such sources (or any monitoring data on overall water releases), assume up to 1 percent of vessel content may be lost during each cleaning occurrence. For example, if you discard (to landfill) "empty" drums that have not been cleaned, calculate the release as 1 percent of normal drum content. If the drums are washed before disposal, this may contribute 1 percent of the content to your wastewater loading.

## Step Five

### *Complete the Toxic Chemical Release Inventory Reporting Form.*

After estimating the quantity of each chemical released via wastewater, solid waste, and air emissions, you must determine the amount of each chemical released to water, land, or air or transferred to an offsite disposal facility. This determination will be based on the disposal method you use for each of your waste streams. Enter the release estimates for each chemical or chemical category in Part III of the Toxic Chemical Release Inventory Reporting Form. Also enter the code for each treatment method used, the weight percent by which the treatment reduces the chemical in the treated waste stream, and the concentration of the chemical in the influent to treatment (see instructions). Report treatment methods that do not affect the chemical by entering "0" for removal efficiency.

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## For More Information

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**Emergency Planning  
and Community  
Right-to-Know  
Hotline**

(800) 535-0202  
or  
(202) 479-2449  
(in Washington, D.C.  
and Alaska)

**Small Business  
Ombudsman  
Hotline**

(800) 368-5888  
or  
(703) 557-1938  
(in Washington, D.C.  
and Virginia)

The EPA brochure, Title III Section 313 Release Reporting Requirements (EPA 560/4-87-001) presents an overview of the new law. It identifies the types of facilities that come under the provisions of Section 313, the threshold chemical volumes that trigger reporting requirements, and what must be reported. It also contains a complete listing of the chemicals and chemical categories subject to Section 313 reporting. The EPA publication, Estimating Releases and Waste-Treatment Efficiencies for the Toxic Chemical Release Inventory Form (EPA 560/4-88-002), presents more detailed information on general release estimation techniques than is included in this document.